Warm Up # 3-4

Copy and complete the table to help you calculate an estimate of the mean score.

Score (x)	Frequency (f)		
1-5	7		
6-10	12		
11-15	15		
16-20	10		
21-25	11		

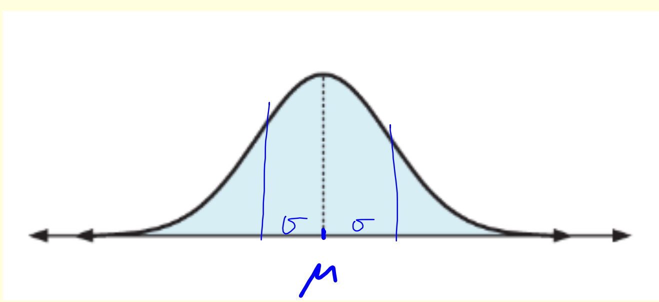
Show a formula and critical totals.

HW Questions: p. 303

EXERCISE 10A

1 Explain why it is likely that the distributions of the following variables will be normal:
  - a the volume of soft drink in cans
  - b the diameter of bolts immediately after manufacture.

2 State the probability that a randomly selected, normally distributed value lies between:
  - a σ below the mean and σ above the mean
  - b the mean and the value 2σ above the mean.



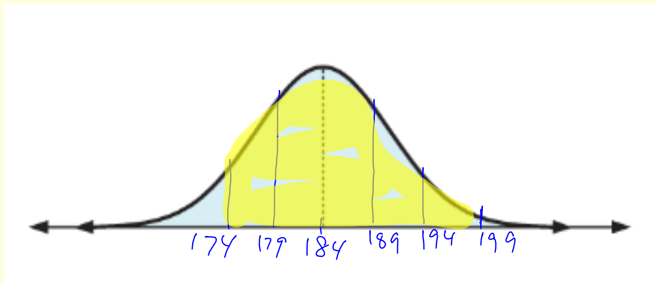
3 The mean height of players in a basketball competition is 184 cm. If the standard deviation is 5 cm, what percentage of them are likely to be:

a taller than 189 cm

b taller than 179 cm

c between 174 cm and 199 cm

d over 199 cm tall?



from p. 300

A **continuous random variable** is a variable which can take any real value within a certain range. We usually denote random variables by a capital letter such as X. Individual measurements of this variable are denoted by the corresponding lower case letter x.

For a continuous variable X, the probability that X is *exactly* equal to a particular value is zero. So, $P(X = a) = 0$ for all a.

For example, the probability that an egg will weigh *exactly* 72.9 g is zero.

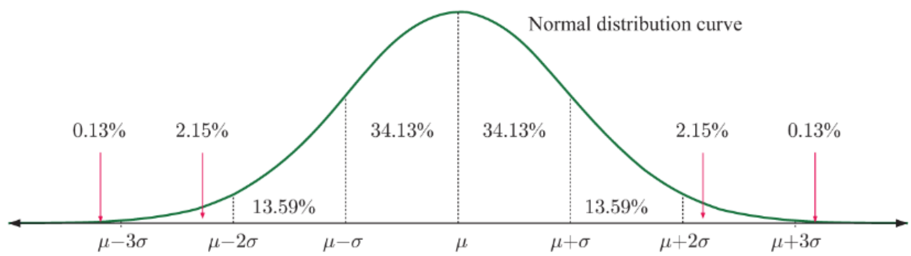
If you were to weigh an egg on scales that weigh to the nearest 0.1 g, a reading of 72.9 g means the weight lies somewhere between 72.85 g and 72.95 g. No matter how accurate your scales are, you can only ever know the weight of an egg within a range.

So, for a continuous variable we can only talk about the probability that an event lies in an **interval**, and:

$$P(a \leqslant X \leqslant b) = P(a < X \leqslant b) = P(a \leqslant X < b) = P(a < X < b).$$

* all the same probability for continuous random variables

For a normal distribution with mean μ and standard deviation σ, the proportional breakdown of where the random variable could lie is shown below.

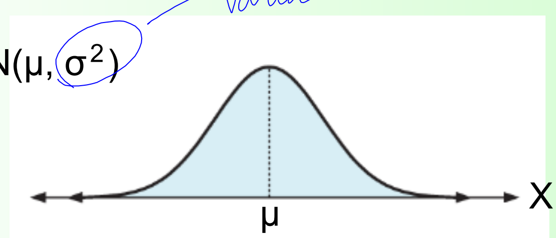


Notice that:
- $\approx 68.26\%$ of values lie between $\mu - \sigma$ and $\mu + \sigma$
- $\approx 95.44\%$ of values lie between $\mu - 2\sigma$ and $\mu + 2\sigma$
- $\approx 99.74\%$ of values lie between $\mu - 3\sigma$ and $\mu + 3\sigma$.

Using Notation

Variance

$X \sim N(\mu, \sigma^2)$



The random variable X is normally distributed with a mean, μ, and standard deviation, σ.

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$$

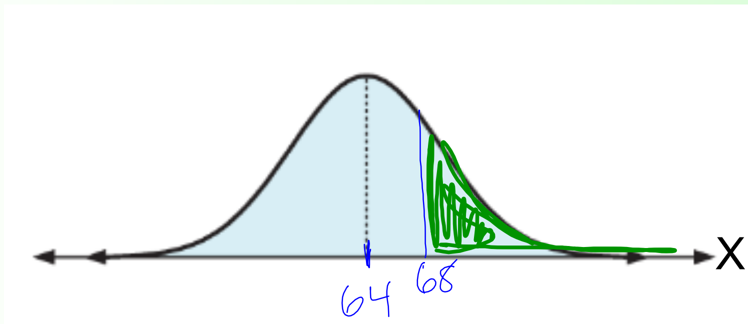
$$\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

Example

$X \sim N(64, 4^2)$

$\mu \quad \sigma^2$

Find: 1) $P(X > 68)$ 2) $P(56 < X < 64)$



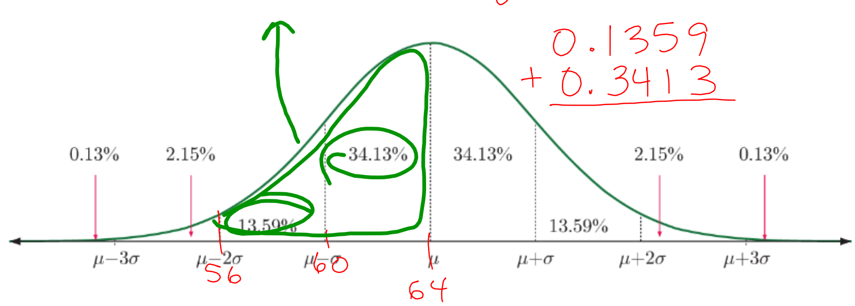
Example

$X \sim N(64, 4^2)$

Find: 1) $P(X > 68)$ 2) $P(56 < X < 64)$

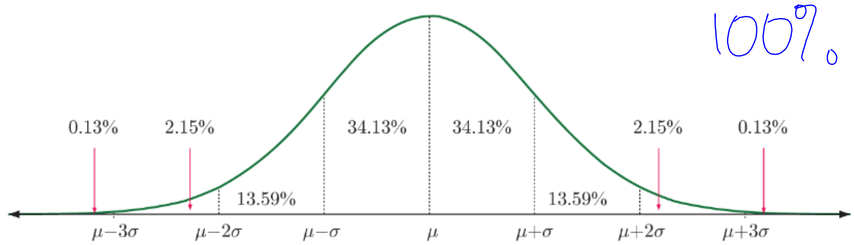
Probability, so add the decimals:

$$\begin{array}{r} 0.1359 \\ +\ 0.3413 \\ \hline \end{array}$$



What do these percentages add up to?

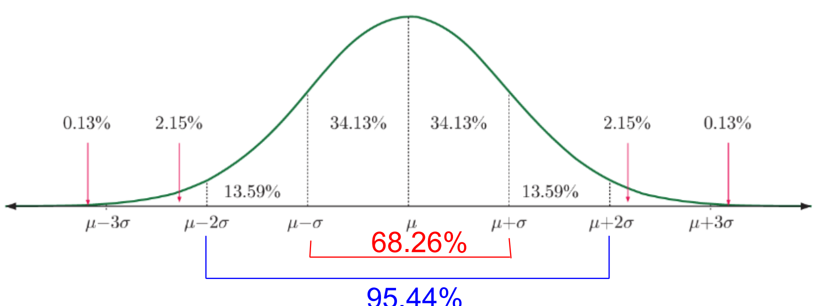
100%



Be careful to notice if you are asked "What percent...." or "What is the probability of..."

$0 \leq$ decimal ≤ 1

What is the difference between those???



Emperical Rule: 68% / 95% / 99.7%

68% of the data is within one σ of the mean.

95% " " two σ's "

99.7% " " three σ's "

Use the Emperical Rule: 68% / 95% / 99.7%

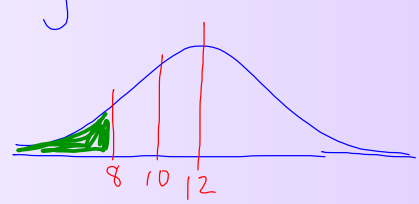
Suppose the time it takes to get to school is normally distributed with a mean of 12 minutes and a std. dev. of 2 min. What is the probability that it will take you less than 8 minutes to get to school tomorrow?

Use the Emperical Rule: 68% / 95% / 99.7%

Suppose the time it takes to get to school is normally distributed with a mean of 12 minutes and a std. dev. of 2 min. What is the probability that it will take you less than 8 minutes to get to school tomorrow?

Let X = time it takes to get to school in minutes.

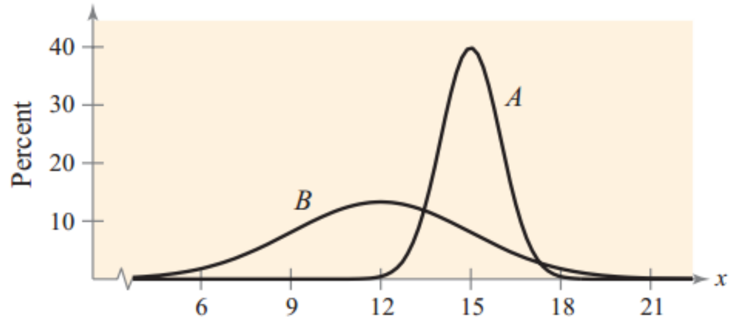
$X \sim N(12, 2^2)$



$$P(X<8) \approx \begin{array}{r} 0.0013 \\ +0.0215 \\ \hline 0.0228 \end{array}$$

Which normal curve has a greater mean? A

Which normal curve has a greater standard deviation? B



Quick review of percentiles:

SAT Score	SAT Percentile
800	99th
700	95th
600	75th
500	45th
400	15th
300	3rd
200	1st

Imagine taking the SAT. You get your results back--- *65th percentile* .

To get that score the testing service placed all of the thousands of scores in order, from smallest to largest and then found yours.

If 65% of the scores were equal to <u>or below</u> yours, then your score would be the 65th percentile.

-using this method one cannot get 0% but one can get 100%

Using this definition:

11 12 14 18 19

is at the **20**th percentile because **20** percent of the scores are less than or equal to

is at the **60** percentile

is at the **100**th percentile.

Using this definition:

11 12 14 18 19

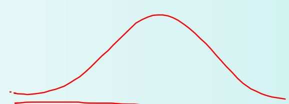
11 is at the **20**th percentile because **20** percent of the scores are less than or equal to **11**

14 is at the **60** percentile

19 is at the **100**th percentile.

HW: 10A p. 303, # 4 - 9

and review for the test!

Draw pictures 

and try to use proper notation

Unit Test: tomorrow